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Εργασία πρώτη

Περιεχόμενα

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# 1 Ecology

## 1.1 Niche

Definitions of the niche date back to 1917,[30] but G. Evelyn Hutchinson made conceptual advances in 1957 by introducing a widely adopted definition: "the set of biotic and abiotic conditions in which a species is able to persist and maintain stable population sizes." The ecological niche is a central concept in the ecology of organisms and is sub-divided into the fundamental and the realized niche. The fundamental niche is the set of environmental conditions under which a species is able to persist. The realized niche is the set of environmental plus ecological conditions under which a species persists. The Hutchinsonian niche is defined more technically as a "Euclidean hyperspace whose dimensions are defined as environmental variables and whose size is a function of the number of values that the environmental values may assume for which an organism has positive fitness.Biogeographical patterns and range distributions are explained or predicted through knowledge of a species' traits and niche requirements.[35] Species have functional traits that are uniquely adapted to the ecological niche. A trait is a measurable property, phenotype, or characteristic of an organism that may influence its survival. Genes play an important role in the interplay of development and environmental expression of traits.[36] Resident species evolve traits that are fitted to the selection pressures of their local environment. This tends to afford them a competitive advantage and discourages similarly adapted species from having an overlapping geographic range. The competitive exclusion principle states that two species cannot coexist indefinitely by living off the same limiting resource; one will always out-compete the other. When similarly adapted species overlap geographically, closer inspection reveals subtle ecological differences in their habitat or dietary requirements.[37] Some models and empirical studies, however, suggest that disturbances can stabilize the co-evolution and shared niche occupancy of similar species inhabiting species-rich communities.[38] The habitat plus the niche is called the ecotope, which is defined as the full range of environmental and biological variables affecting an entire species.

## 1.2 Niche construction

Organisms are subject to environmental pressures, but they also modify their habitats. The regulatory feedback between organisms and their environment can affect conditions from local (e.g., a beaver pond) to global scales, over time and even after death, such as decaying logs or silica skeleton deposits from marine organisms.[39] The process and concept of ecosystem engineering is related to niche construction, but the former relates only to the physical modifications of the habitat whereas the latter also considers the evolutionary implications of physical changes to the environment and the feedback this causes on the process of natural selection. Ecosystem engineers are defined as: "organisms that directly or indirectly modulate the availability of resources to other species, by causing physical state changes in biotic or abiotic materials. In so doing they modify, maintain and create habitats.The ecosystem engineering concept has stimulated a new appreciation for the influence that organisms have on the ecosystem and evolutionary process. The term "niche construction" is more often used in reference to the under-appreciated feedback mechanisms of natural selection imparting forces on the abiotic niche.[28][41] An example of natural selection through ecosystem engineering occurs in the nests of social insects, including ants,

bees, wasps, and termites. There is an emergent homeostasis or homeorhesis in the structure of the nest that regulates, maintains and defends the physiology of the entire colony. Termite mounds, for example, maintain a constant internal temperature through the design of air-conditioning chimneys. The structure of the nests themselves are subject to the forces of natural selection. Moreover, a nest can survive over successive generations, so that progeny inherit both genetic material and a legacy niche that was constructed before their time.

## 1.3 Biome

Biomes are larger units of organization that categorize regions of the Earth's ecosystems, mainly according to the structure and composition of vegetation. There are different methods to define the continental boundaries of biomes dominated by different functional types of vegetative communities that are limited in distribution by climate, precipitation, weather and other environmental variables. Biomes include tropical rainforest, temperate broadleaf and mixed forest, temperate deciduous forest, taiga, tundra, hot desert, and polar desert. Other researchers have recently categorized other biomes, such as the human and oceanic microbiomes. To a microbe, the human body is a habitat and a landscape.Microbiomes were discovered largely through advances in molecular genetics, which have revealed a hidden richness of microbial diversity on the planet. The oceanic microbiome plays a significant role in the ecological biogeochemistry of the planet's oceans.

## 1.4 Biosphere

The largest scale of ecological organization is the biosphere: the total sum of ecosystems on the planet. Ecological relationships regulate the flux of energy, nutrients, and climate all the way up to the planetary scale. For example, the dynamic history of the planetary atmosphere's CO2 and O2 composition has been affected by the biogenic flux of gases coming from respiration and photosynthesis, with levels fluctuating over time in relation to the ecology and evolution of plants and animals.[46] Ecological theory has also been used to explain self-emergent regulatory phenomena at the planetary scale: for example, the Gaia hypothesis is an example of holism applied in ecological theory.[47] The Gaia hypothesis states that there is an emergent feedback loop generated by the metabolism of living organisms that maintains the core temperature of the Earth and atmospheric conditions within a narrow self-regulating range of tolerance.

## 1.5 Individual ecology

Understanding traits of individual organisms helps explain patterns and processes at other levels of organization including populations, communities, and ecosystems. Several areas of ecology of evolution that focus on such traits are life history theory, ecophysiology, metabolic theory of ecology, and Ethology. Examples of such traits include features of an organisms life cycle such as age to maturity, life span, or metabolic costs of reproduction. Other traits may be related to structure, such as the spines of a cactus or dorsal spines of a bluegill sunfish, or behaviors such as courtship displays or pair bonding. Other traits include emergent properties that are the result at least in part of interactions with the surrounding environment such as growth rate, resource uptake rate, winter, and deciduous vs. drought deciduous trees and shrubs.One set of characteristics relate to body size and temperature.

# 2 Environment

## 2.1 Composition

Earth science generally recognizes 4 spheres, the lithosphere, the hydrosphere, the atmosphere, and the biosphere[3] as correspondent to rocks, water, air, and life respectively. Some scientists include, as part of the spheres of the Earth, the cryosphere (corresponding to ice) as a distinct portion of the hydrosphere, as well as the pedosphere (corresponding to soil) as an active and intermixed sphere. Earth science (also known as geoscience, the geosciences or the Earth Sciences), is an all-embracing term for the sciences related to the planet Earth.[4] There are four major disciplines in earth sciences, namely geography, geology, geophysics and geodesy. These major disciplines use physics, chemistry, biology, chronology and mathematics to build a qualitative and quantitative understanding of the principal areas or spheres of Earth.

## 2.2 Geological activity

The Earth's crust, or lithosphere, is the outermost solid surface of the planet and is chemically and mechanically different from underlying mantle. It has been generated greatly by igneous processes in which magma cools and solidifies to form solid rock. Beneath the lithosphere lies the mantle which is heated by the decay of radioactive elements. The mantle though solid is in a state of rheic convection. This convection process causes the lithospheric plates to move, albeit slowly. The resulting process is known as plate tectonics. Volcanoes result primarily from the melting of subducted crust material or of rising mantle at mid-ocean ridges and mantle plumes.

# 3 Ecosystem

## 3.1 Definition

There is no single definition of what constitutes an ecosystem.[3] German ecologist Ernst-Detlef Schulze and coauthors defined an ecosystem as an area which is "uniform regarding the biological turnover, and contains all the fluxes above and below the ground area under consideration." They explicitly reject Gene Likens' use of entire river catchments as "too wide a demarcation" to be a single ecosystem, given the level of heterogeneity within such an area.[11] Other authors have suggested that an ecosystem can encompass a much larger area, even the whole planet.[7] Schulze and coauthors also rejected the idea that a single rotting log could be studied as an ecosystem because the size of the flows between the log and its surroundings are too large, relative to the proportion cycles within the log.[11] Philosopher of science Mark Sagoff considers the failure to define "the kind of object it studies" to be an obstacle to the development of theory in ecosystem ecology.Ecosystems can be studied through a variety of approaches—theoretical studies, studies monitoring specific ecosystems over long periods of time, those that look at differences between ecosystems to elucidate how they work and direct manipulative experimentation.[12] Studies can be carried out at a variety of scales, from microcosms and mesocosms which serve as simplified representations of ecosystems, through whole-ecosystem studies.[13] American ecologist Stephen R. Carpenter has argued that microcosm experiments can be "irrelevant and diversionary" if they are not carried out in conjunction with field studies carried out at the ecosystem scale, because microcosm experiments often fail to accurately predict ecosystem-level dynamics.The Hubbard Brook Ecosystem Study, established in the White Mountains, New Hampshire in 1963, was the first successful attempt to study an entire watershed as an ecosystem. The study used stream chemistry as a means of monitoring ecosystem properties, and developed a detailed biogeochemical model of the ecosystem.[15] Long-term research at the site led to the discovery of acid rain in North America in 1972, and was able to document the consequent depletion of soil cations (especially calcium) over the next several decades.

## 3.2 History

The term "ecosystem" was first used in 1935 in a publication by British ecologist Arthur Tansley.[fn 1][37] Tansley devised the concept to draw attention to the importance of transfers of materials between organisms and their environment.[38] He later refined the term, describing it as "The whole system, ... including not only the organism-complex, but also the whole complex of physical factors forming what we call the environment".[39] Tansley regarded ecosystems not simply as natural units, but as "mental isolates".[39] Tansley later defined the spatial extent of ecosystems using the term ecotope.G. Evelyn Hutchinson, a limnologist who was a contemporary of Tansley's, combined Charles Elton's ideas about trophic ecology with those of Russian geochemist Vladimir Vernadsky. As a result he suggested that mineral nutrient availability in a lake limited algal production. This would, in turn, limit the abundance of animals that feed on algae. Raymond Lindeman took these ideas further to suggest that the flow of energy through a lake was the primary driver of the ecosystem.

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|  | | Presentation | |  | |  | | 20 | |  | | |  |
| 2 |  | | | | | History &  Theories |  | | Brief Paper | |  | |  | | 20 | |  | | | March 24 |
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|  | Group Project | |  | |  | | 50 | |  | | | April 14 | |
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# 4 Atmosphere

## 4.1 Pressure

Atmospheric pressure at a particular location is the force per unit area perpendicular to a surface determined by the weight of the vertical column of atmosphere above that location. On Earth, units of air pressure are based on the internationally recognized standard atmosphere (atm), which is defined as 101.325 kPa (760 Torr or 14.696 psi). It is measured with a barometer.Atmospheric pressure decreases with increasing altitude due to the diminishing mass of gas above. The height at which the pressure from an atmosphere declines by a factor of e (an irrational number with a value of 2.71828...) is called the scale height and is denoted by H. For an atmosphere with a uniform temperature, the scale height is proportional to the temperature and inversely proportional to the product of the mean molecular mass of dry air and the local acceleration of gravity at that location. For such a model atmosphere, the pressure declines exponentially with increasing altitude. However, atmospheres are not uniform in temperature, so estimation of the atmospheric pressure at any particular altitude is more complex.

## 4.2 Composition

A planet's initial atmospheric composition is related to the chemistry and temperature of the local solar nebula during planetary formation and the subsequent escape of interior gases. The original atmospheres started with the radially local rotating gases that collapsed to the spaced rings that formed the planets.[clarification needed] They were then modified over time by various complex factors, resulting in quite different outcomes.The atmospheres of the planets Venus and Mars are primarily composed of carbon dioxide, with small quantities of nitrogen, argon, oxygen and traces of other gases.The atmospheric composition on Earth is largely governed by the by-products of the life that it sustains. Dry air from Earth's atmosphere contains 78.08% nitrogen, 20.95% oxygen, 0.93% argon, 0.04% carbon dioxide, and traces of hydrogen, helium, and other "noble" gases (by volume), but generally a variable amount of water vapor is also present, on average about 1% at sea level.The low temperatures and higher gravity of the Solar System's giant planets—Jupiter, Saturn, Uranus and Neptune—allow them more readily to retain gases with low molecular masses. These planets have hydrogen–helium atmospheres, with trace amounts of more complex compounds.Two satellites of the outer planets possess significant atmospheres. Titan, a moon of Saturn, and Triton, a moon of Neptune, have atmospheres mainly of nitrogen. When in the part of its orbit closest to the Sun, Pluto has an atmosphere of nitrogen and methane similar to Triton's, but these gases are frozen when it is farther from the Sun.Other bodies within the Solar System have extremely thin atmospheres not in equilibrium. These include the Moon (sodium gas), Mercury (sodium gas), Europa (oxygen), Io (sulfur), and Enceladus (water vapor).The first exoplanet whose atmospheric composition was determined is HD 209458b, a gas giant with a close orbit around a star in the constellation Pegasus. Its atmosphere is heated to temperatures

over 1,000 K, and is steadily escaping into space. Hydrogen, oxygen, carbon and sulfur have been detected in the planet's inflated atmosphere.

# 5 Fauna

## 5.1 Etymology

Fauna comes from the name Fauna, a Roman goddess of earth and fertility, the Roman god Faunus, and the related forest spirits called Fauns. All three words are cognates of the name of the Greek god Pan, and panis is the Greek equivalent of fauna. Fauna is also the word for a book that catalogues the animals in such a manner. The term was first used by Carl Linnaeus from Sweden in the title of his 1745[1] work Fauna Suecica.

## 5.2 Subdivisions

Cryofauna are animals that live in, or very close to, ice.Cryptofauna are the fauna that exist in protected or concealed microhabitats. InfaunaI fauna are benthic organisms that live within the bottom substratum of a body of water, especially within the bottom-most oceanic sediments, rather than on its surface. Bacteria and microalgae may also live in the interstices of bottom sediments. In general, infaunal animals become progressively smaller and less abundant with increasing water depth and distance from shore, whereas bacteria show more constancy in abundance, tending toward one million cells per milliliter of interstitial seawater.

# 6 Η οικογενεια μου